



VoIP 101:

An introduction to the basics of
Voice over Internet Protocol


How to guide



Introduction

You may have heard of VoIP—that it's the future of telephone service, and that you can save a lot of money using it. But what exactly is it? Very simply, **VoIP**, or Voice over Internet Protocol, is the technology that allows us to have phone service over the Internet.

VoIP may be a new term for you, but the technology isn't new. The telephone companies, who use what is referred to as the **public switched telephone network (PSTN)**, have been employing VoIP technology for years. Yet today, VoIP is becoming a viable solution for mainstream consumers—both businesses and individuals.

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So why would you want it? The most obvious answer is to save money. VoIP acts as a bridge between your Internet connection and the PSTN, allowing you to have phone service without requiring an account with the phone company. That, coupled with VoIP's unique pricing model, means that users can often cut their long-distance calling expenses dramatically.

Saving money is one good reason to use VoIP, but there are others. VoIP offers the same features that you'd get with traditional phone service plus many others that can both increase productivity and create a more flexible work environment for your workforce. VoIP allows for real-time collaboration—you can use it to set up instant conference calls or check the availability of your coworkers. It can also help you improve customer service by allowing you to stay connected on the go.

But VoIP is an emerging technology, and that means that unlike your standard phone service, it's not exactly plug and play. Getting the most out of VoIP requires a little bit of homework, and in some cases some real technical help. This guide will cover the basics of VoIP and help you decide if and how VoIP could fit into your workplace.

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basics

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The basics



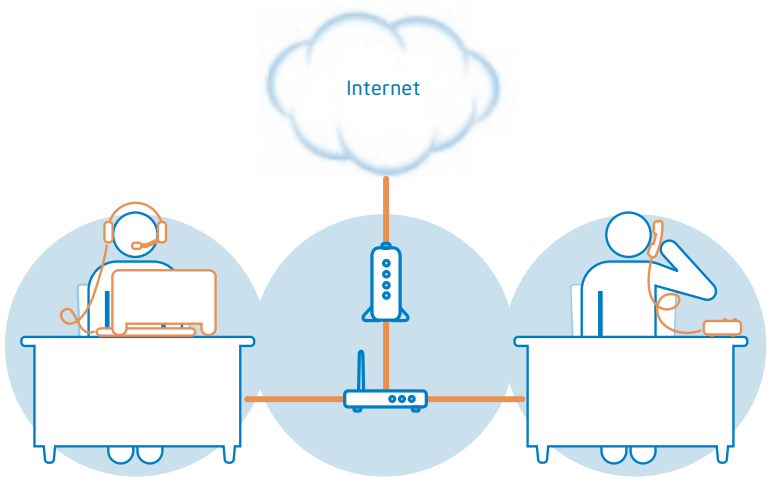


How does VoIP work?

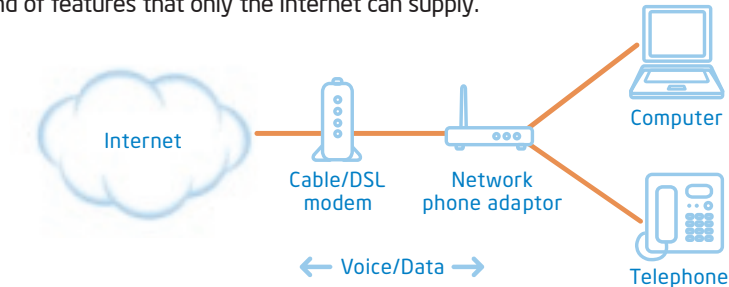
VoIP works by taking **analog** signals and converting them to digital data that can be sent over a network—the Internet in most cases, but also any private network. It requires that you have a broadband network connection, the necessary items to create that broadband connection—a broadband modem, your computer, a router, etc.—and a device to convert the data. We'll cover VoIP equipment in more detail in the next section.

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At the highest level, there are two ways to talk using VoIP: through a web interface that allows you to make calls from your computer (assuming you have a sound card) and using a VoIP phone or headset (devices that allow you to bypass your computer entirely and link directly to your Internet connection). The experience of using your computer to talk may feel foreign at first, but the experience of using a VoIP phone is quite similar to using a standard telephone. Either way, VoIP naturally integrates your phone service with your digital life.



With VoIP, you can check your voicemail on your computer and attach voicemail messages to e-mails. You can have your calls forwarded to you no matter where you are (assuming you have access to a computer and the Internet). VoIP also offers very comprehensive call handling options. Based on caller id, you can decide, in advance, to send calls from specific numbers to voicemail, to another line, etc. VoIP offers the kind of features that only the Internet can supply.



Four ways to implement VoIP

One of the great advantages of using VoIP is that it's an infinitely scalable technology. It can work just as well for one person as it can for a company with thousands of employees. The difference lies in how it's implemented. The table on the next two pages identifies the four most common ways of implementing VoIP:

Implementation

How it works

Computer-to-computer

Some service providers offer free software that you can download and install on your computer—essentially using your computer as a phone. You need to be sound-enabled and have a headset or microphone set up to use it. This allows you to talk from your computer to another person on his or her computer only, and in many cases, you can only use it with another person who has downloaded the same software.

Service provider: individual

VoIP service providers offer plans for individuals much like traditional phone service plans. You sign up, pay a monthly bill, and have all of the usual calling features—long-distance calling, caller id, call waiting, etc.—plus the benefit of using a regular phone to make calls. With VoIP, you'll also get extras like free conferencing and advanced voicemail which allows you to check your messages from your computer and forward them as e-mail attachments.

Who it's for	Level of effort	Cost
Best for 1-5 person small businesses. Computer-to-computer VoIP is also a great option for personal use.	Very easy. Less than 1 hour to get started.	\$0 (or close to it)
Best for 1-5 person businesses. Plans usually include an ATA (analog phone adaptor) and/or VoIP hardphone.	Easy. Less than one day to get started (once the equipment is purchased or arrives from service provider).	\$15-\$25 per month

Implementation

How it works

Service provider:
small business

VoIP service providers also offer plans for small businesses. They're much like the plans offered to individuals but often include added business features like dedicated fax lines.

Custom VoIP

Custom VoIP solutions are created expressly for you by either a very knowledgeable, in-house IT resource or a system integrator serving as a VoIP vendor or consultant (different than a service provider). They work the same way that other VoIP solutions do in that they require a broadband connection, allow you to integrate your phone service and your electronic functions, etc., but with a custom solution you can incorporate traditional PBX features that may not be available otherwise.

Who it's for	Level of effort	Cost
Best for 10-30 person businesses. Basic equipment is usually included. You'll also have the option to buy additional, upgraded equipment to use with your plan.	Moderate. May take up to one week to get all users connected to system and up to speed (once the equipment is purchased or arrives from service provider).	\$15-\$25 per month
Best for larger businesses. These are custom-designed solutions and involve a larger investment in VoIP equipment and infrastructure.	Challenging. Depending on the complexity of your custom solution, can take weeks.	\$5,000+

The equipment—what you need to get started

Any use of VoIP will require that you have a reliable power source and a broadband Internet connection. Here's a quick look at the various types of VoIP-specific equipment that might also be a part of your plan:

Device	Description	Price range
ATA	An ATA (analog telephone adaptor) is a device that converts analog signals to digital data. It allows you to connect a standard phone to your Internet connection for use with VoIP. ATAs are sometimes referred to as VoIP gateways.	\$70-\$100
Soft phone	A soft phone is actually a software application that you install on your computer to create a VoIP user interface. In order to use a soft phone, you'll need a headset and/or microphone.	\$0-\$80

Device	Description	Price range
IP phone	An IP phone, or hard phone, is a self-contained piece of equipment (that looks like a regular phone) that can communicate directly via your Internet connection. Phones don't have to be routed through your computer or an ATA, and don't require any software.	\$80-\$400
Wi-Fi/WLAN phone	Like IP phones, Wi-Fi/WLAN phones don't require a computer or ATA to use VoIP. They link directly to your IP Internet connection. Unlike IP phones, they're wireless and connect to the Internet via a wireless base station.	\$200-\$500

When you're ready to buy your equipment, you'll be able to find it both online and in many large electronics stores.

Here's what VoIP devices look like:





← basics

A woman with blonde hair, wearing a blue floral top and a headset, is sitting at a desk in an office. She is holding a red pen and looking down. In the background, there is a computer monitor and another person wearing a striped shirt. A large white number '2' is overlaid on the left side of the image.

2

VoIP and your business



your business

VoIP and your business

VoIP vs. traditional phone service

Here's a look at how VoIP solutions compare with traditional PSTN phone systems and some tips to ease the transition.

	VoIP	PSTN
Setup costs	Setup costs depend entirely on your VoIP implementation. Computer-to-computer VoIP is free, while there is a considerable initial investment when switching to a custom VoIP system.	PSTN setup costs, while not negligible, are smaller than VoIP setup costs.
Operating costs	This is where VoIP often shines. Once your system is implemented, cost savings can be substantial.	With PSTN your costs are usually directly linked to hours of usage. More hours equals more cost.
Equipment	Equipment is usually included when you sign up with a service provider. Custom VoIP solutions, though, require a considerable investment in equipment.	PSTN equipment is relatively inexpensive. Used hardware is often available...but sometimes hard to scale.
Mobility	Because VoIP runs on your Internet connection, it travels with you. Just as you would access your e-mail remotely, you can access your VoIP phone service allowing for total mobility.	PSTN is, of course, not mobile.



your business

	VoIP	PSTN
Features	VoIP has all of the features of PSTN plus additional features made possible by using the Internet as its backbone: enhanced call handling, linking of voicemail and e-mail, etc.	PSTN offers the standard features we've come to expect in phone service.
Reliability	VoIP runs on your network and requires power. To ensure reliability you must take the right precautions.	PSTN is very reliable.
Security	VoIP is like the rest of your network. Its protection depends on the steps you take to make it secure.	It actually takes more effort to breach VoIP security than it does to tap into a PSTN call.
Scalability	Adding to your existing VoIP system is simply a matter of buying new equipment and upgrading your network when necessary.	Scaling a traditional phone system involves more heavy lifting—wiring work, etc.

Which VoIP is right for me?

Choosing the right VoIP solution for your business can be challenging. Answering these questions will help you through the evaluation process:

1. How many people will your VoIP implementation need to service?

With VoIP, numbers count. If you're just looking to service a couple of people, you might opt for a computer-to-computer VoIP solution, or an individual plan from a VoIP service provider. For small companies with

10–30 employees, a group plan from a service provider is going to be the best bet. And for companies with more than 30 people or companies that have very high bandwidth needs, a custom business implementation may be what you need.

2. How big is your budget?

There are a number of VoIP solutions to choose from, and the costs for each vary widely. Computer-to-computer and service provider options are typically the most affordable. At the other end of the spectrum,



 your business



full-blown custom VoIP solutions, while they ultimately offer substantial savings, can cost thousands of dollars up-front. So deciding on your budget is an important part of determining which VoIP solution is best for you.

3. Can your existing network handle the voice traffic you plan to have?

Remember, the voice data (or packets) will travel over your existing network just as other data does, like e-mail and large file transfer, and it will require **bandwidth**. If you want to serve more users than your network can

handle, you'll need to upgrade. If that's an expense you're unprepared for, you may need to scale back your VoIP implementation and opt for a smaller plan servicing fewer users.

4. Do you have an in-house IT resource that can help implement and maintain the system?

If you do, you're one step closer to being a good candidate for a custom solution. If you don't, you may want to opt for one of the other solutions.

5. Will you have a power backup plan?

Remember, unlike traditional phone service, VoIP relies on power. If the power goes out, so does your phone service. For very small businesses, you may be able to get by with cell service during infrequent power outages. But for larger groups, it's critical that you have a backup source of power. If you're not prepared to make that investment, consider switching only a small portion of your business over to VoIP with a computer-to-computer solution or an individual service provider plan.

6. Are you prepared to maintain your system?

Eventually, VoIP may be just like traditional phone service—very low maintenance. But as it is today, most VoIP solutions require at least some upkeep. If you're working with a service provider, you'll likely have their customer support at your disposal. But if you've implemented a custom VoIP solution, you'll either need to entrust upkeep to your IT department, or hire a vendor to maintain it.



your business



A high-angle, over-the-shoulder photograph of a person with short dark hair, wearing a blue long-sleeved shirt and a headset with a microphone. They are sitting and working on a silver laptop. The laptop screen displays a software interface with various windows and buttons. A large, white, stylized number '3' is overlaid on the left side of the image, partially covering the laptop screen and the person's arm. The background is a dark, textured surface, possibly a desk or floor.

3

Preparing for VoIP

Preparing for VoIP

You don't have to dive headlong into VoIP. You can try it out and decide if it really is the right thing for your company by moving just one part of your business to a VoIP system. Choose a part of your business that would really benefit from VoIP but that's not so unique that the team's experience and needs wouldn't apply to other groups. A sales force can be a good choice, especially if they travel a lot.

Starting small—the VoIP test drive

Implement a computer-to-computer VoIP solution for that group and then see how it goes. Are they using it as much as you expected? Is it increasing productivity? Have you saved on long-distance calling? The test drive gives you the chance to see what works and what doesn't before you make the real investment of moving your whole company. You may even find that a small, computer-to-computer solution serves all of your needs.

Or you might discover that you want something closer to traditional phone service, in which case consider starting

small with a service provider. Service provider plans are affordable, and to a certain extent, they can grow with you—once you've signed on, the only investment in scaling is buying equipment for additional users. The service provider option does cost a bit more, but it comes with the added benefits of feeling more like your existing phone service and providing you the technical support you might need to get up and running.

VoIP and Intel® technology platforms

VoIP can be a great money saver, but the choice of computers is critical—whether your employees are using VoIP on notebooks or desktop computers.

Business users on the move can collaborate more effectively with Intel® Centrino® Duo mobile technology-based



laptops. Enhanced access point selection for intelligent roaming capabilities delivers better **Quality of Service (QoS)**, and our new dual-core processors also allow greater connectivity options, better wireless performance overall, and greater battery life.*

For employees using VoIP on desktop computers, the dual-core processing performance of the Intel® Pentium® D Processor enables high-fidelity VoIP phone calls despite heavy multi-tasking system loads.

Desktop and notebook computer platforms include Intel® High Definition (HD) Audio¹ to deliver CD-quality sound.

Security and performance

At the heart of Intel® Centrino® Duo mobile technology is the Intel® Core™ Duo processor—a **CPU**, or central processing unit, with two complete execution cores. These two cores share the same housing, but can operate independently of one another. That allows your computer to deliver better performance while balancing power requirements.

Intel mobile dual-core processor-based laptops also offer features to enhance security—an added plus when implementing VoIP—and they can allow businesses to improve PC virus security. When enabled with Intel® Active Management Technology,^ψ Intel® Centrino® Duo mobile technology makes it possible for IT managers to find, fix, and protect computing assets on their network.

For more information on Intel® Centrino® Duo mobile technology go to www.intel.com/centrino.



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preparing



Going custom? How to find the right VoIP vendor

You've come to the conclusion that you do, in fact, need a custom VoIP solution. So, what next? Developing an RFP for the project is a project unto itself, but it doesn't have to be mysterious. Here is a list of the key points to address with any potential vendor:

1. What services do they offer?
2. How well do they understand your needs?
3. Do they have any relevant experience that is directly applicable to your needs? Ask for case studies of projects like yours.
4. Do they have a special relationship with VoIP providers, or are they unbiased?
5. Do they have references available?
6. Can their system integrate with your existing network and communications equipment?
7. Can they build a solution upon your existing analog equipment or can they take back your old analog equipment and give you credit for it?
8. What sort of support services do they offer? Are they available all day, every day? Are there additional costs associated with support?
9. And, finally, what will the costs be for both setup and maintenance?

Common VoIP questions and answers

1. What's the quality like?

The sound quality, in many cases, is better than it is with PSTN. VoIP allows you to hear the full spectrum of sound, making it easier, for example, to distinguish a "c" from a "d." But it does depend on your implementation. After all, the quality of your call is really a bandwidth issue, and if you have ample bandwidth or are managing bandwidth correctly, your call quality will be good.

2. Will it slow down my network?

Only if your network isn't robust enough to handle

voice traffic. But that's a question to ask and answer *before* you implement VoIP. If you find that you need network upgrades and complete them, your network speed should be maintained regardless of the introduction of VoIP.

3. Is VoIP secure?

VoIP is actually more secure than traditional PSTN calls, but because it uses the Internet to transfer data, it faces the same kind of security issues as other Internet applications. In other words, you need to take the same security precautions with your VoIP system that you'd take to protect your network.

4. Are there interoperability issues? In other words, will my various pieces of equipment work together or could they be incompatible?

As VoIP matures, there are fewer and fewer interoperability issues. **SIP**, or session initiation protocol, is emerging as a favorite standard supported by VoIP and as the technology matures, more equipment is SIP-compatible. Check with your IT consultant if you decide to develop a custom solution.

5. What about 911?

Dialing 911 won't automatically work with VoIP. Many service providers are required to route 911 calls automatically, but if you're using one that doesn't (and that's something to know ahead of time), you'll have to program your phone company interface equipment to treat 911 calls appropriately.

6. What if we lose power?

If you lose power and haven't put your VoIP system on a backup power source of some kind, your phones will go down. That's why backup power sources are critical for VoIP success.

Looking for more information? Here's a good resource
for more in-depth consideration:

www.intel.com/go/voip.



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Key terms

Analog—The technology used to transmit radio and TV signals.

ATA (analog telephone adaptor)—A device that converts analog signals to digital data, sometimes referred to as a VoIP gateway.

Bandwidth—This refers to the quantity of data that can be sent over a network during a set period of time.

CPU (central processing unit)—Often called the “brains” of the computer, this is where your computer does most of its work.

IP phone—Also called “hard phone,” a self-contained piece of equipment that looks like a traditional phone and connects directly to your Internet connection, bypassing your computer.

PSTN (public switched telephone network)—The system that standard phone service runs on.

QoS (Quality of Service)—A series of protocols that give voice data precedence over other data to ensure a good calling experience.

SIP (session initiation protocol)—The emerging VoIP standard.

Soft phone—a software application that you install on your computer to create a VoIP user interface.

Wi-Fi/WLAN phone—Like an IP phone, but wireless.

VoIP (Voice over Internet Protocol)—the technology that allows phone service over the Internet by converting analog data into digital data.



* System performance, battery life, high-definition quality and functionality, and wireless performance and functionality will vary depending on your specific operating system, hardware, and software configurations. References to enhanced performance as measured by SYSMark* 2004, PCMark* 2005, and 3DMark* 2005 refer to comparisons with previous generation Intel® Centrino® mobile technology platforms. References to improved battery life as measured by MobileMark* 2005, if applicable, refer to previous generation Intel Centrino mobile technology platforms. Wireless connectivity and some features may require you to purchase additional software, services, or external hardware. Availability of public wireless LAN access points is limited, wireless functionality may vary by country, and some hotspots may not support Linux-based Intel Centrino mobile technology systems. See www.intel.com/products/centrino/more_info for more information.

¹ Intel® High Definition Audio requires a system with the Intel® 955, 945, 925, 915 or 910 Express Chipset and a motherboard with an appropriate codec and the necessary drivers installed. System sound and VoIP quality will vary depending on the codec, drivers, speakers and microphones.

ψ Intel® Active Management Technology requires the computer to have additional hardware and software, a connection with a power source, and a network connection. Check with your PC manufacturer for details.

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